A CASE STUDY OF OACCUPATIONAL SAFETY AND HEALTH MANAGEMENT SYSTEMS IN THE TEXTILE INDUSTRY

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ABSTRACT

Occupational safety and health management in the Textile Industry emphasize the health and safety of the workers, Industry is one of the occupations which affect the health of workers, in fact, the objective of an occupational health service is not only to keep the workers physically healthy but also mentally and psychologically stable. Occupational health is perturbed by the health safety issue of work. The hazards revealed in the setting can harmfully affect human health. There are different hazards faced by the workers in Textile Industry such as exposure to cotton dust, exposure to chemicals, noise and ergonomics issues, etc.… Most of the workers are illiterate and do not know what protective measures should be adopted for their jobs. To prevent t health issues for workers in industries it is essential that the workers be aware of the various occupational hazards in the industry. It is also necessary that the management should take the necessary steps to protect workers from potentially hazardous situations.

Keyword: - *Occupational health service, Hazards, Illiterate, Potential hazards situation*

1. INTRODUCTION

Thousands of workers are employed in Spinning industries under different job categories including Ginning, Carding, combing, spinning, and packing. The Spinning industry workers are exposed to several chemicals including dyes, solvents, optical brighteners, finishing agents, and numerous types of natural and synthetic fiber dust which affect their health. In this paper, an attempt has been made to summarize the self-reported health problems among a group of spinning industry workers. Before getting to the main subject of occupational health and safety, it is important to look at the Spinning industry workers' health and their access to healthcare services. Workers come from various suburbs to the spinning industry and the villages beyond them and are generally aged between 18 and 45 years.

The Indian textile industry is one of the largest in the world with a massive raw material and textiles manufacturing base. Our economy is largely dependent on textile manufacturing and trade in addition to other major industries. About 27% of the foreign exchange earnings are on account of the export of textiles and clothing alone. The textiles and clothing sector contributes about 14% to the industrial production and 3% to the ores domestic product of the country. Around 8% of the total excise revenue collection is contributed by the textile industry. So much so, the textile industry accounts for as large as 21% of the total employment generated in the economy. Around 35 million people have been directly employed in textile manufacturing activities. Indirect employment including the manpower engaged in agricultural-based raw-material production like cotton and related trade and handling could be stated to be around another 60 million.

Textile is one of India's oldest industries and has a formidable presence in the national economy since it contributes to about 14 percent of manufacturing value-addition, accounts for around one-third of our gross export earnings, and provides gainful employment to millions of people. They include cotton and jute growers, artisans, and weavers who are engaged in the organized as well as decentralized and household sectors spread across the entire country.

The Factories Act emphasizes work safety, lighting, temperature and ventilation, cleanliness, disposal of wastes and effluents, dust and fumes, and overcrowding, among other things. These aspects do not receive adequate attention in many garment factories in the country. Lack of general training on health and safety, specifically first aid training, is another common anomaly that compromises worker safety. While the Factories Act provides for annual medical examinations for hazardous industries, the classification of the spinning industry as non-hazardous has made the situation worse for workers. "Exposure to cotton dust causes irritation in the upper respiratory tracts and bronchi, which after prolonged exposures slowly progresses to chronic obstructive pulmonary disease. Besides all spinning industries have dust problems. The smallest of these fibers are breathed in by the workers and, over the long term, cause a variety of respiratory problems. The Problems are made to Clean the e worse as many industries use brooms and dusters in the workplace rather than the use of industrial vacuum cleaners which simply spreads the do let us dust control are often made worse as workers do correctly wear their dust masks." moreover, workers are not informed of the dangers associated with their work, or The precautions to be taken while handling chemicals.

Frequency of hearing loss among textile industry workers of the weaving unit in Karachi, Pakistan. Noise level is more than the acceptable limit of 85 dB (A) for 8 hours of exposure stipulated. There is an immediate need to develop and implement noise regulations in Pakistan [1]. Cotton Dust level in Textile industries and its impact on Humans were carried out by another researcher. The knitting process produces the maximum dust level compared to other processes, so we suggest that the preventive measures in the knitting session particularly should be more effective than in other sections [2].

Occupational Hazards and Illnesses of Filipino Women Workers in Export Processing Zones by another author showed that many of the small-and large-scale companies reportedly had health and safety committees, but none of them functioned properly [3]. In a Study of Occupational Health and Safety in the Garment Industry in Bangalore, health and safety provisions available to workers at their workplace were very rudimentary. Occupational health and safety need to be also addressed from the care perspective, i.e., through the ESI [4].

Another research hass been carried out for reduced lung cancer mortality and exposure to synthetic fluids and biocide in the auto manufacturing industry. The protective effect of synthetic MWF (Metal Working Fluid) against lung cancer mortality persisted through the extended period of follow-up, although attenuated, and was observed only among workers with co-exposure to biocide and synthetic MWF [5]. The medium and small-sized garment industries in Tirupur were found to have poor illumination, improper ventilation, excessive noise, congested work area, and unergonomic workstations. The workers were exposed to dust, chemicals mainly in the form of solvents, ergonomically problems, psychosocial problems, etc [6].

Vibration and noise caused by lawn maintenance machines in association with risk to health due to Whole-body vibration levels can often be reduced by using vibration isolation and by installing suspension systems between the operator and the vibrating source [7]. A Study of Pulmonary Function Tests in Cotton Mill Workers of Guntur District has been carried out for Inhalation of cotton dust causes the release of histamine from mast cells. Histamine acts on the smooth muscles resulting in bronchoconstriction. Airway mucus glands secrete more amount of mucus in the presence of histamine [8]. Health SIMUN of Textile Industry Workers. Pre% alC114.V and Socioeconomic Con-elates of Different Health Problems. Textile fiber dust are known for their health effects including cancer Skin problems and memory loss was found to be associated with tobacco chewing smoking, and diet respectively [9].

2. MATERIALS AND METHODS

Raw material has an important impact on yarn quality and production. Let’s see how it affects yarn production, there are many parameters through which we can easily assess the properties of cotton first one is the fiber length which is the most important characteristic of cotton and is measured in terms of staple length, span length and effective length is fibers have good staple length it results in the form of high production because less twist per inch is required to give enough strength.

Labour is critical to the sector's current competitiveness and long-term viability. Workers' skill levels, productivity, and motivation, the industry's ability to attract and retain the right quantity and quality of workers, domestic labor

laws and regulations, and workers living conditions and costs in urban areas, are all critical in the context of a continuously changing economic environment. In South Asia and other emerging economies, where low-cost labour is essential for industry competitiveness, the Spinning industry has been subject to various allegations of labour abuse, including long hours, forced overtime, and low wages.

Machinery is the backbone of every industry. In the textile, industrial machines are working 24 hours so it is important that their efficiency would be excellent. Let's look at the comparison between the old and new machines. In Spinning Mills, we analyzed, "why new machines are better than old machines?" In the simplex department they have erected 10 frames and in which one of them is the old one. If we compare the old machine with the new machine from a production point of view then, it is clear that new machines are better than old ones.

Fig -1: **Thread forming machine**

The end down is due to the less strength of yarn and greater spindle speed. Adding to stops, no. of spindles per frame, lift of bobbin rail, and cleanliness of the department also affects the production. More spindles on a frame increase its efficiency. Cleanliness means no fibrous mass is floating in the atmosphere of the ring otherwise ends down rate will be increased.

Doffing means the removal of a full-size package and replacing it with the empty one. During doffing, the machine is stopped and it is carried out by •killed workers. For coarse counts like 7s, I Onset, doff time is less and for finer counts like 30s, 40s, etc., time is more. For the 20S it takes 90-110 min to complete doff. During doffing, it should be kept in mind that it should be carried out in the shortest possible time.

The changing of the roving bobbin when it is empty and replacing it • a new full roving bobbin is called creeping. Creeping time should be as -mall as possible.

The production can be increased by increasing the bobbin size because with a bigger bobbin less doff is required per shift. The Bobbin size depends on ring dia, but as we increase the ring dia, the ends down rate also increase so it also has a limit. Usually, a 42 mm ring dia is available on which dia bobbin can be prepared.

Proper maintenance of the machine is necessary otherwise it results in the form of many problems like sudden shutdowns and big production losses In ATMs maintenance is done on daily basis to overcome the problems which are faced every day. Usually in ATM one machine is opened 30 in the department for maintenance. Proper maintenance results in the form of efficient working of machines and good outputs. For example, proper maintenance and proper preparation of roving results in the form of minimizing the end breakage rate.

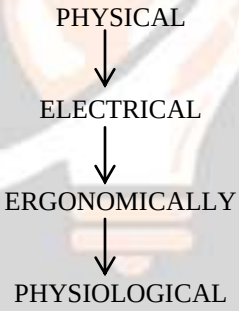
Energy is the basic requirement of any industry but now a day in Bangladesh it's a big issue right now that's why the textile industry is suffering from many problems. Now take a look and discuss what kind of problems they are facing and how they create hurdles for productivity. Bangladesh’s industry mainly runs on these two resources i.e.,

gas and electricity. But due to a shortage of these necessities, many textile units are shutting down. Sometimes due to sudden failures machine parts are being destructed.

3. HAZARDS IDENTIFICATION

There are several safety and health issues associated with the textile industry. This article aims at studying each of these issues about the Indian textile industry in detail, along with the possible solutions for these problems.
The major safety and health issues in the textile industry can be stated as under:
1) Exposure to cotton dust
2) Exposure to chemicals
3) Exposure to noise
4) Ergonomic issues
Every environment in which a working activity is performed presents higher or lower accident hazards. The textile industry is characterized by the presence of a wide typology of machines and equipment, with automatic or manual transport systems connecting the various machines and departments. With dwell and storage areas; therefore the maximum attention must be paid by the operator, who has to comply scrupulously with the procedures and the active and passive safety systems with which modern machines are largely equipped. Often distraction or the excess of confidence in the machines are the occasions of accident hazards. The hazards can also be increased by the environmental conditions of certain departments, by the kind of organization, and by the existing workplaces.
The risks of damage and diseases for the human organism in the textile industry can have the following causes:

TYPES OF HAZARDS



3.1 Physical Hazard

A physical hazard is a type of occupational hazard that involves environmental hazards that can cause harm with or without contact. Physical hazards include ergonomic hazards, radiation, heat and cold stress, vibration hazards, and noise hazards. Engineering controls are often used to mitigate physical hazards. Physical hazards are a common source of injuries in many industries. They are perhaps unavoidable in certain industries, such as construction and mining, but over time people have developed safety methods and procedures to manage the risks of physical danger in the workplace. Employment of children may pose special problems. An engineering workshop specializing in the fabrication and welding of components has to follow the Personal Protective Equipment (PPE) at work regulations 1992. An employer must provide 'all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work which protects him against one or more risks to his health and safety. In a fabrication and welding workshop, an employer would be required to provide face and eye protection, safety footwear, overalls, and other necessary PPE.

3.2 UNHEALTHY MICROCLIMATE

This is the case in particular of the dye houses, the environment of which is characterized by a high humidity level and by the presence of more or less harmful or irritant fumes, which are often associated with high temperatures and with an insufficient change of air. Also in certain spinning departments the necessary humidity rate, often combined with a certain presence of dust in the air, can result in breathing problems.

3.3 SWEATSHOPS

Workers often have to perform their tasks under "sweatshop" conditions. They work long hours every day, sometimes without even a weekly rest day, and are often not paid for overtime. Many of them do not have a regular contract. In recent years, wages for spinning workers in the majority of Asian countries have fallen in real terms except in China. The gap between prevailing wages paid in general to an average worker and living wages for garment workers in these countries has widened.

3.4 NOISE

Noise represents in various departments and above all in weaving mills a problem of primary importance, especially if there is not enough room available and no adequate soundproofing intervention on the machine and the rooms have been carried out. In such cases, the alternative is the use of individual safety devices. A high noise level can entail a reduction in the functions and other secondary collateral effects:

Table -1. Work environment of MMF industry

Parameter	Range	Mean
Noise (dBA)	88-92	90
Lighting (Lux)	45-63	54
Temperature (c)	28-30	29

Table no: 4.1

3.5 EXPOSURE TO CHEMICALS

Workers in the textile industry are also exposed to several chemicals, especially those engaged in the activities of dyeing, printing, and, finishing. Chemicals based on Benzedrine, optical brighteners, solvents and fixatives, crease-resistance agents releasing formaldehyde, flame retardants that include organ phosphorus and organ bromine compounds, and antimicrobial agents are used in textile operations.

3.6 ELECTRICAL HAZARD

The following is a list of common electrical hazards found on spinning units:

- Improper grounding
- Exposed electrical parts
- Inadequate wiring
- Damaged insulation
- Overloaded circuits
- Wet conditions
- Damaged tools and equipment

3.7 IMPROPER GROUNDING

Grounding is the process used to eliminate unwanted voltage. The ground is a physical electrical connection to the earth. The ground pin safely returns the leakage current to the ground. Never remove the ground pin.

3.8 EXPOSED ELECTRICAL PARTS

Exposed wires or terminals are hazardous. Report these conditions to your supervisor. This electrical panel has missing circuit breakers. Never use a panel that has exposed wires. All openings must be closed. Outer insulation on electrical cords must be intact.

Fig -2:**Exposed Electrical Parts**

3.9 INADEQUATE WIRING
Use properly rated extension cords. Make sure your power tools are being used with a properly rated extension cord.

3.10 DAMAGED INSULATION
Defective or inadequate insulation is a hazard. Insulation prevents conductors from contacting each other or you. Never attempt to repair a damaged cord with tape. Never use tools or extension cords with damaged insulation. Never hang extension cords from nails or sharp objects. Do not run extension cords through doors or windows.

3.11 OVERLOADED CIRCUITS
Overloaded circuits can cause fires. Use proper circuit breakers. Do not use power strips or surge protectors on construction sites.

3.12 DAMAGED TOOLS AND EQUIPMENT
Do not use electric tools that are damaged. You may receive a shock or be electrocuted. Double-insulated tools are labeled. It will be marked "Double Insulated.

3.13 WET CONDITIONS
Always avoid using tools in wet locations. Water increases the risk of electric shock.

3.14 ERGONOMIC HAZARD
3.14.1 Illumination
Working position, precision, rhythm, repetitiveness, turnover system: various tasks require considerable stress on the sight, or need body postures that have to be maintained for a long time or require much attention rapidity of execution, repetitiveness at very short intervals, temporary adaptations which can be the source of various pathologies both at physical and at the psychical level.

3.14.2 Accidents
The textiles sector has many hazards that can cause injury to workers, from transport in the workplace (lift truck), dangerous large work equipment and plant, to the risk of slips from a wet working environment. Workers being struck by objects, such as moving mechanical parts and vehicles are a significant cause of injury in the sector. There also exist the risks of fire and explosions, for example from heating plants used for vapor generation.
The lack of regular contracts means many workers get injured in factory fires, and the relatives of those who die, do not receive any compensation, because they are not registered as formal employees of the companies, and the management, therefore, does not identify them as their workers
.
3.14.3 Unsafe work
Systemic hazardous conditions represent a common feature of many factories in this sector. The rapid expansion of the industry has led to the adaptation of many buildings, built for other purposes residential, for instance into factories, often without the required permits. Other plants have had extra floors added or have increased the

workforce and machinery to levels beyond the safe capacity of the building. Lack of appropriate protective equipment, old and outdated wiring at risk of short circuits (a major cause of fires), and non-existent or outdated fire extinguishing facilities are often reported in these overcrowded workplaces. Fire exits are often deliberately blocked by factory owners, and windows are even barred, thus increasing the death toll in accidents.

Fig -3:**Unsafe Work**

3.14.4 Psychosocial issues

Work-related stress has been defined as being experienced when the demands of the work environment exceed the workers' ability to cope .with or control them. Work-related stress may be an issue in some areas of the textiles sector, being associated for example with repetitive and fast-paced work, where the worker does not influence how the job is done.

3.14.5 Trade unions

Trade unions are often suppressed and union organizers intimidated, including physically. Workers claim that some managers mistreat employees involved in setting up unions or force them to resign. Some claim they have been beaten up, sometimes by local gangsters attacking workers outside the workplace, and even at their homes.

3.14.6 Polluted water

A finite resource that is quickly becoming scarce, and is used at every step of the process both to convey the chemicals used during that step and to wash them out before beginning the next step. The water becomes full of chemical additives and is then expelled as wastewater; which in turn pollutes the environment:

- by the effluent's heat
- by its increased pH
- and because it's saturated with dyes, de-framers, bleaches, detergents, optical brighteners, equalizers, and many other chemicals used during the process.

3.14.7 Night shift

During the survey, doctors felt that night shift employees face physiological, emotional, and biological problems, based on the disturbing rhythmic pattern of sleeping and waking. While hormones and chemicals are produced when a person is awake, body organs rest and are at their lowest during sleep. They feel that a change in the working schedule affects all this balance and leads to sleep deprivation disturbing the rhythm of the body and negatively affecting concentration, job performance, social interactions, and general health. So to overcome these problems women must get at least 7-8 hours of undisturbed sleep by simulating night-like conditions using heavy drapes to block the sunlight. It is also suggested that women on the night shift should try to restrict the use of caffeine, alcohol, cigarettes, and chocolates. Yoga and meditation will prove beneficial for them. Doctors agree that if they can do that, most of their health problems would be over. In 'fact, they may end up saving a couple of more working hours for themselves and their families. It is suggested that proper rest and alternate employment in the daytime should be given to women during illness and menstruation periods and a period of at least three months before and two months after childbirth. This period should be extended in case a medical certificate is produced to the effect that it is necessary for the health of the mother or child.

3.14.8 Safety and health of women

Occupational safety and health should be managed in a gender-sensitive way, being aware that there may be differences in the exposure of women to risks compared to men. Gender-sensitive interventions should be participatory, involving the workers concerned, and based on an examination of the real work situation. There has to 'be a real commitment from management to take safety and health and gender issues seriously, and no assumptions should be made about who is at risk from what hazards.

At each step of the risk assessment process described above, gender issues should be considered. For example:

- Ask both male and female workers what problems they have in a structured way,
- Take care of unintentional gender bias when "grading.' risks as high, medium, or low,
- Ensure that reproductive health issues are included when seeking to eliminate risk at source or when trying to substitute substances,
- Ensure that monitoring of the performance of preventive measures covers tasks carried out by both men and women.

3.15 FIRE HAZARDS

3.15.1 Inflammable and explosive dust

The three ingredients that cause fires are heat, oxygen, and combustible material. When all three components are present, combustion takes place. Many specks of dust and powders that emanate out of the industrial processes are easily flammable. These dust carry characteristics that differentiate them such as:

- Dust that explodes easily.
- Dust that ignites easily.

An explosion is defined as the process by which combustion. Li occurs and spreads so rapidly as to create high pressure. In this case, the fire expands from a source of ignition and develops high pressure when restricted in an area. Explosions have lower and upper limits (of dust concentration). A lower limit of explosion indicates that the concentration of dust particles is below the lower limit of explosion. Below this level, the dust concentration will not explode even on ignition. This happens because the heat produced in such a circumstance is not sufficient to affect other dust particles. Alternatively, there could be a dust concentration of explosive levels but there may not be enough oxygen to start the fire. To counter the hazards of fire and explosions, it is necessary to know the characteristics of the dust. For example, fine aluminum dust explodes at very low limits of explosion whereas coarse aluminum dust does not catch fire even under the influence of another source of heat.

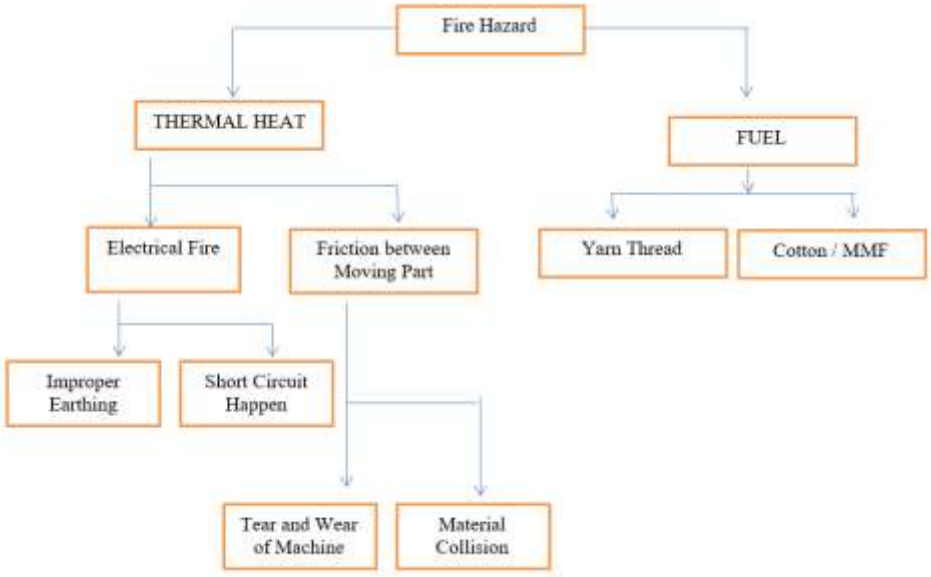


Fig -3: **Fire Hazard**

4. CASE STUDY OF INDUSTRY

4.1 RPN (Risk Priority Number)

The Risk Priority Number (RPN) identifies the greatest areas of concern. RPN is the product of:
(1) Severity rating
(2) Occurrence rating
(3) Detection rating

4.2 Severity

A rating corresponding to the seriousness of an effect of a potential failure mode

4.3 Occurrence

A rating corresponds to the rate at which a first-level cause and its resultant failure mode will occur over the design life of the system, over the design life of the product, or before any additional process controls are applied.

4.4 Detection

A rating corresponding to the likelihood that the detection methods or current controls will detect the potential failure mode before the product is released for production for design, or process before it leaves the production facility.

Risk Priority Number (RPN) = Severity x Occurrence x Detectability

For a given potential failure mode, how bad the outcome is multiplied by how likely it would happen multiplied by what things are in place today to prevent or notice it before it happens.

4.5 Qualitative Scale for Severity, Occurrence, and Detection

Table -2. Qualitative Scale for Severity, Occurrence, and Detection

Rank	Severity	Occurrence	Detection
1.	None	Rarely	Almost Certain
2.	Very Minor	Remote	Very High
3.	Minor	Very Slight	High
4.	Very Low	Slight	Moderately High
5.	Low	Low	Moderate
6.	Moderate	Medium	Low
7.	High	Moderately High	Very Low
8.	Very High	High	Remote
9.	Serious	Very High	Very Remote
10.	Hazardous	Almost Certain	Almost Impossible

S.NO	HAZARD	CONSEQUENCES	REMEDIAL ACTION	RPN NO = Severity X Occurrence X Detectability
1	Physical hazards a) Noise	The noise makes hearing loss	1. Proper maintenance lubricating control noise 2. Isolation of the machine	7X8X7=392
2	b) Dust	Causes Byssinosis	1. Workers should wear PPE. 2. Increase the no. of Dust collector 3. Proper House Keeping	8X9X8=576
3	c) Light	Eye pain and getting visibility loss	1. Increase the bulb luminance 2. Increase the visibility roofing sheet	6X7X6=252
4	d)Lifting Heavyweight	Muscular- Skeletal Disorders	1. Lift by 2 persons. 2. Keep your backbone straight while lifting the load 3. Use Lifting Vehicle	7X6X7=294
5	e) Improper Ventilation	Gets Tired	Increase the ventilation fans	8X10X9=720
6	Fire Hazards	Loss of life, Damages to the equipment.	1. Fire alarm with ups connection 2. Sprinkler system with ups connection 3. Increase the fire safety cylinders 4. Give training to workers	8X7X9=504
7	a) Welding operation	The spark ignition is very dangerous	1. Use safety equipment 2. Allowed to do with proper Training persons	10X9X10=900
8	b) Electrical Short Circuit happens	If no trip occurs its gets fire	Use MCB (Miniature circuit breaker)	7X8X8=448
9	c) Smoking	Easily gets fire	Security is not allowed brought inside the mill.	10X9X6=540
10	Electrical hazards: a) Improper Earthling	Trip Occurs	Avoid improper earthing and loose connection	9X8X10=720
11	b) Improper isolation	Electric Shock	All circuits are to be enclosed in a proper Isolation cover	10X9X9=810
12	c) Moisture	Proper wiring	Moisture to be kept in control	9X9X8=648
13	d)Motor high-speed rotation Due to high voltage	The machine can get failure	The circuit breaker must be individual for all the machine wise and department wise	9X9X8=648
14	e) Usage of old wire	Not proper current flow	Use of wire as per Electrical standard	8X9X9=648
15	f) Looping in the running line	gets an electrical shock and gets tripped due to overload	Avoid looping in the mainline	9X10X9=810
16	g) Electrical	ECB board checks the	Monitor maintenance	8X9X9X648

	Maintenance	connection Grease the motor frequently	routine card by floor supervisor	
17	Chemical	Not good for health, Eye, skin	1. Wear proper safety gloves and equipment. 2. Check the blood samples of the workers and advised remedial action	9X10X9=810

4.6 NOISE POLLUTION

Because of the high spindle speeds reached on new machines (ring spindles up to 20,000 rap), spinning mills can generally be assumed to generate a great deal of noise. Noise is an anted that interfaces with the function in a given time prolonged exposure to high noise cause psychological effect and physical damage including a loss of concentration which finally affects job performance. Today machinery manufacturers are taking continuous efforts to reduce the noise level but the measures are not adequate to protect from noise-related diseases. **Noise levels of 70 to 100db (A) are commonly recorded in the workroom.** Since the eighties, the windowless design has been frowned upon by the building authorities in light of the physiological problems caused by employees. To improve workplace design fields of vision around 2 -5 % of the floor area of the workrooms must be provided, and special glazing is needed for this.

Noise Level: - The survey has so far been undertaken by any public or private sector agencies to collect data about noise levels in the production department of textile mills except the study by PCSIR, applied accounts group in a texturizing plant. The levels of noise were found to be as under.

- **Filament take up section = 93.20Db**
- **Texturizing section =94.80 Db**
- **Compressor house = 99.50Db**

These noise levels are higher than the permissible limit of 90Db specified in the federal standards of the U.S.A. for the maximum exposure duration of 8 hours per day.

4.6.1 Causes of Noise Pollution in the Textile Industry:

The causes of noise pollution in a spinning mill are mainly due to friction made in machines, and different types of gear mechanism used to give a drive to the different types of rollers and pulley. The following types of gear parts are used: -

1. **Simple gear**
2. **Continuous gear train**
3. **Chain drive**
4. **bevel drive**
5. **worm and worm wheel**
6. **variable drive**
7. **Pawl drive**

All the above gears are used as required for the motion in different parts of a machine, in the high-speed machine, a high-speed motor is used. This motor is connected to the gear link, during high-speed working is more friction contact made between two metal gears causing the sound of wear of gear. If the gear teeth pitch is less and diameter is less and aped is more than more sound is produced and noise is caused. If a sufficient big gear pitch is used for high-speed gear decrease in sound is possible. But due to an absence of space available for the particular machine is less. So, the machine manufacturer used small pitch gears and caused noise causes.

4.6.2 Effect of Noise on Environment:

Noise health effects are both behavioral in nature the unwanted sound is called noise pollution. This unwanted sound can damage physiological health. Noise pollution can cause annoyance and aggression; hypertension is the leading cause of health problems whereas tinnitus can lead to forgetfulness, severe depression, and at times panic attacks. Hearing the mechanism for chronic exposure to noise leading to hearing loss is well established. The elevated sound levels cause trauma to the cochlear structure in the inner ear. Which gives rise to irreversible hearing loss? A very loud sound in a particular frequency range can damage the cochlea's hair cells that respond to that range thereby

reducing the ear's ability to hear those frequencies in the future. However, loud noise in any frequency range has deleterious effects across the entire range of human hearing.
High noise levels can contribute to cardiovascular effects and exposure to moderately high levels during a single 8-hour period causes a statistical rise in blood pressure of five to ten points.
This will increase stress and vasoconstriction leading to the increased blood pressure noted above as well as to the increased incidence of coronary artery disease. Noise can have a detrimental effect on animals by causing stress, and increasing the risk of mortality by changing the delicate balance in predator/prey detection and avoidance. By interfering with their use of sound communication especially in reproduction and in navigation. Acoustic overexposure can lead to temporary or permanent loss of hearing. An impact of noise on animal life is the reduction of usable habitat that noise areas may cause which in the case of endangered species may be part of the path to extinction. One of the best-known causes of damaged caused by noise pollution is the death of certain species of beached whales, brought on by the loud sound of military sonar.

4.6.3 Hazards of Noise Pollution on the Environment Due to Spinning

1. The eardrum is damaged when exposed to very loud and sudden noise. The pair of calls in the inner ear are chronically damaged. Prolonged exposure to noise of certain frequencies pattern leads to hearing loss.
2. According to KRYTER in 1970, noise causes heart output to decrease with fluctuation in arterial blood pressure and vasoconstriction of peripheral blood vessels.
3. Recently, the report indicates that blood is thickened by excessive noise. Eosinophilia, hyperglycemia, hypokalemia, and hypoglycemia are caused by the alteration in the blood due to noise.
4. Noise affects sleep and work performance, especially in watch repairs and others where precision is called for.

4.6.4 Control measures for noise pollution:

Now a day's automated machines are being used which are purely based on mechatronics and it offers the following advantage:

High-efficiency accuracy
Ease of maintenance
Low mechanical complicity

Building mechanisms on speed frame and ring frame as it was traditionally based on cam and linkage mechanism show pronounced impact on noise pollution. A reduction of 10% in speed decreases noise up to 2%. The following points show some features of modern machines.

- Proper design of jig and fixer shows a reduction in vibration up to 20 dB.
- Provision of suction systems at various points results in dust reduction by 30-35%.
- Enclosed machine parts minimize accidental causes by 50%.

The above details are coming under active measures and the following details show passive measures.

- Blocking airborne sound
- Absorption of Airborne sound
- Vibration damping

Table -3. Reduction in noise based on no. of days

Days	Reduction In Noise (Max. limit 95db)
Day1	95
Day2	92
Day6	84
Day8	81
Day11	79
Day16	75
Day19	71

4.6.5 Air pollution

In the spinning mill dust and flying is the main reason for air pollution but along with this, there are also too many things affecting this.

Causes of Air Pollution

- Ginning factories discharge large amounts of cotton dust. Cotton ginning and pressing have been identified as traditional industries under the unorganized sector which functions on a seasonal basis.
- A major problem of cotton dust exists in the blow room and carding section of the spinning mill whereas exposure level in other areas is comparatively not much.
- Poor relative humidity follow-up in the department.
- Blow down on blow-off is the cleaning of equipment and surface with compressed air.
- Cleaning of clothing or floors with compressed air.
- Improper handling of waste during transportation.
- Insufficient ventilation system.
- The improper suction system in the key areas such as blow room and carding and wherever there is a chance of dust generation.
- When the material such as laps, silver cans, and roving bobbins are delayed in processes or stored for an extended period in an area where there is a likelihood of significant dust or lint accumulation. Poor follow-up in covering the material leads to dust formation.
- Usage of spring-loaded cans and carts as waste receptacles creating dust dispersion during comparison of the spring-loaded bottoms.
- Poor working conditioning/procedures and cleaning methods.

Classification of Cotton Dust:

Table -4. Size of the particles

TYPE	SIZE OF PARTICLE (mm)
Trash	Above 500
Dust	50-500
Micro-dust	15-50
Breathable dust	Below 15

The micro dust comprises 50-80% fiber fragments, leaf and husk fragments, 10-25% sand and earth, and 10-25% water soluble materials. The high proportion of fiber fragments indicates that a large part of micro dust arises in the course of processing. Nearly about 40% of the micro dust is free between the fibers and flocks, 20-30% is loosely bound, and the remaining 20-30% is bound to the fibers.

Types of Dust

- **Inhalable dust:** It is a term used to describe dust that is hazardous when deposited anywhere in the respiratory tree including the mouth & nose.
- **Thoracic dust:** It is defined as those materials that are hazardous when deposited anywhere within the lung airways and the gas exchange region.
- **Respirable dust:** Repairable dust is defined as that fraction of the dust reaching alveolar regions of the lungs.

4.6.6 Effects of Air Pollution:

Byssinosis:

Workers exposed to the cotton dust-laden environment generally become patients of Byssinosis. It is a breathing disorder that occurs in some individuals with exposure to raw cotton dust. Characteristically workers exhibit shortness of breath and / the feeling of chest tightness when returning to work after being in the mill for a day or more. There may be increased cough and phlegm production. Changes in the levels of ESR, LDH3, and histamine may be used as indicators to assess pulmonary function in workers who are exposed to cotton dust. It was suggested that low hemoglobin and poor immunity against disease may also predispose the outcome of pulmonary dysfunction at an earlier stage. Cotton dust extract induces the release of histamine from samples of human lung tissue in vitro. Therefore it is believed that histamine release is responsible for the measured symptoms of Byssinosis, viz “chest tightness”.

Dr. Richard schilling, a British physician developed a system of grading workers based on their breathing complaints on the first workday of the week. Schillings classification grades Byssinosis according to how far it has progressed. Schillings’ classification is as follows:

1) Grade 0 = no complaints of breathing problems.
2) Grade ½ = chest tightness and /shortness of breath sometimes on the first day of the workweek
3) Grade 1 =chest tightness and/or shortness of breath always on the first day of the work week.
4) Grade 2 = chest tightness and /or shortness of breath on the first workday and another day of the workweek.
5) Grade 3 = chest tightness and/or shortness of breath on the first work day and other days as well as impairment of lung function.
It is being lived that the degree or severity of response for individuals with symptoms of Byssinosis is related to the dust level of the workplace. The beginning steps in yarn preparation generally produce more dust. Therefore, the closer to the beginning of the process, the higher will be the dust level and the more likely the pulmonary reaction or response for some workers.

4.6.7 Dust control measure
1] Monitoring of cotton Dust concentration in the occupational environment.
2] Provide medical surveillance to the cotton dust-exposed workers.
3] Establishing safe working practices to reduce the exposure level.
4] Training and education of workers.
5] Engineering controls to reduce emissions.
6] Use of dust masks.

4.6.8 Medical monitoring
Medical examinations are to be provided to prospective employees before their initial assignment. As a minimum, the examination should include:
1} A standardized respiratory questionnaire inquiring about such concerns as a cough, chest tightness, and smoking history.
2}A pulmonary function (breathing) test including the forced vital capacity (FVC), the amount of air one can forces out after taking a deep breath and forcing an expiratory volume in 1 second (fev 1), the amount of air forced out during the first second of expiration.
3} A medical history of any existing health problems or disease that may affect breathing.

Table -5. Permissible exposure limits for cotton dust in different work areas

DEPARTMENT	PEL (MICROGRAMS PER CUBIC METER)
Opening	200
Picking	200
Carding	200
Combing	200
Roving	200
Spinning	200
Winding	200
Warping	200
Slashing	750
Weaving & Knitting	750
Waste House	750

4.6.9 Environmental exposure monitoring
1] Sampling of the workplace must be done at least every six months to determine the amount of cotton dust in the environment.
2] Measurements must be representative of all employees in the workplace.
3] Sampling will be done in all work areas and on each shift.
4] While sampling is done for a period equal to at least three–quarters of the shift. generation of cotton dust. The percent of the cotton fiber in the mix; the grade of the cotton & where it was grown; the types of yarn being run: and the number and types of machines operating in each area may all affect the amount of cotton dust in the workplace.

Table -6. Reduction of air pollution in the industry: AQI- Air Quality Index

DAYS	Reduction level of pollution in mm
DAY1	500 AQI
DAY5	450AQI
DAY8	380AQI
DAY12	300AQI
DAY15	220AQI
DAY18	180AQI
DAY25	125AQI
DAY30	50AQI

5. CONCLUSION

This case study is to identify the occupational safety and health management hazardous effects and noise pollution and air pollution over people working in the textile industry. The major hazards that happen are physical, Electrical, Chemical, ergonomically & physiological, along with these some of the things which can create hazards are more working hours, noise, dust, and improper ventilation. The human body capacity and the proper design of the equipment are effective only if the environment is congenial with aiming for continual Improvement the project work will focus give a solution for manmade fiber textile industry workers to realize their health and safety at the workplace.

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